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# Do Elderly and Young Patients Derive Similar Relative Survival Benefits from Novel Oncology Drugs? A Systematic Review and Meta-Analysis

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## Background

- Elderly patients are commonly believed to derive less benefit from treatment, even if they fulfil clinical trial eligibility.
- We aim to examine if novel oncology drugs provide differential treatment outcomes for elderly and young patients.

## Methods

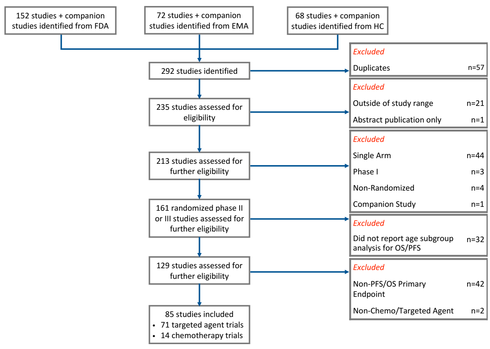


**Figure 1:** Randomized control trials (RCTs) cited for clinical efficacy evidence in novel oncology drug approvals between 2006 and 2015

- Independent reviewers extracted survival hazard ratios (HRs) and confidence intervals (CIs) for reported age-based subgroups.
- Meta-analyses based on an inverse variance random effects model were used to compare pooled HRs.
- Sensitivity analyses conducted specific to cancer type, primary endpoint, and the type of systemic treatment.

| Characteristic | N | % |
|---|---|---|
| **Experimental Drug Type** | | |
| Chemotherapy | 14 | 16.5 |
| Targeted Agent | 71 | 83.5 |
| **Cancer Type** | | |
| Lung Cancer | 16 | 18.8 |
| Gastric Cancer | 5 | 5.9 |
| Colorectal Cancer | 8 | 9.4 |
| Melanoma | 6 | 7.1 |
| Renal Cell Carcinoma | 7 | 8.2 |
| Multiple Myeloma | 4 | 4.7 |
| Chronic Lymphocytic Leukaemia | 7 | 8.2 |
| Pancreatic Neuroendocrine Tumours | 2 | 2.4 |
| Thyroid Cancer | 4 | 4.7 |
| Gastroesophageal Adenocarcinoma | 1 | 1.2 |
| Prostate Cancer | 5 | 5.9 |
| Other | 20 | 23.5 |
| **Primary Endpoint** | | |
| OS | 32 | 37.6 |
| PFS | 47 | 55.3 |
| TTP | 2 | 2.4 |
| OS and PFS (co-primary) | 3 | 3.5 |
| ORR and PFS (co-primary) | 1 | 1.2 |
| **Age Subgroups** | | |
| <60 and ≥60 | 3 | 3.5 |
| <60, 60-69, and 70-74 | 4 | 4.7 |
| <65 and ≥65 | 61 | 71.8 |
| <65, ≥65-<75, and ≥75 | 2 | 2.4 |
| <75 and ≥75 | 3 | 3.5 |
| Other | 12 | 14.1 |

**Table 1:** Summary of study characteristics

## Results

- 85 RCTs, including 55,512 patients, reported age-based survival outcomes and were included.
- 1 study reported age-based toxicity and no studies reported age-based quality of life results.

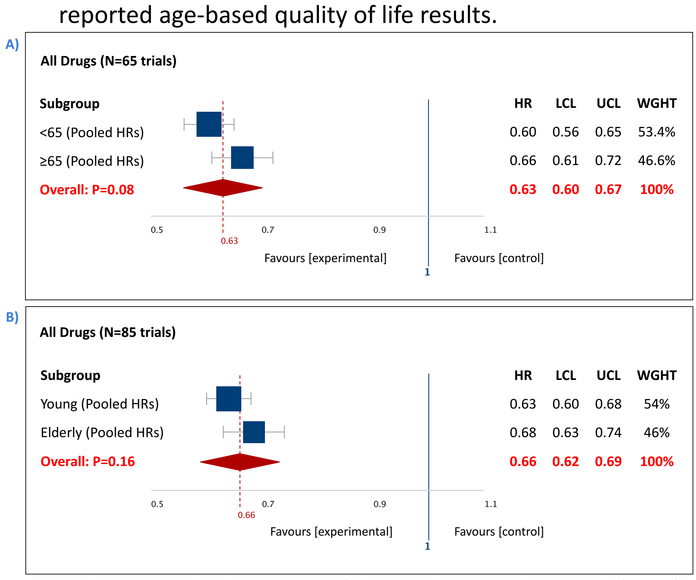


**Figure 2:** Summary forest plots for all drugs, **A)** Primary meta-analysis, <65 versus ≥65 (*P=0.08*), **B)** Sensitivity analysis, Young versus Elderly (*P=0.16*)

| | | |
|---|---|---|
| **All Drugs – OS (N=28 trials)** | | |
| <65 | 0.77 [0.72-0.83] | P=0.20 |
| ≥65 | 0.83 [0.77-0.89] | |
| **All Drugs – PFS (N=38 trials)** | | |
| <65 | 0.50 [0.46-0.56] | P=0.25 |
| ≥65 | 0.56 [0.49-0.64] | |
| **Targeted Agents (N=55 trials)** | | |
| <65 | 0.58 [0.53-0.63] | P=0.06 |
| ≥65 | 0.65 [0.59-0.72] | |
| **Chemotherapy Drugs (N=10 trials)** | | |
| <65 | 0.73 [0.65-0.82] | P=0.99 |
| ≥65 | 0.73 [0.64-0.84] | |
| **Lung Cancer (N=15 trials)** | | |
| <65 | 0.69 [0.59-0.80] | P=0.48 |
| ≥65 | 0.75 [0.62-0.90] | |
| **Colorectal Cancer (N=7 trials)** | | |
| <65 | 0.70 [0.62-0.79] | P=0.52 |
| ≥65 | 0.74 [0.65-0.84] | |
| **Renal Cell Carcinoma (N=6 trials)** | | |
| <65 | 0.64 [0.48-0.84] | P=0.36 |
| ≥65 | 0.77 [0.57-1.03] | |
| **Chronic Lymphocytic Leukaemia (N=6 trials)** | | |
| <65 | 0.34 [0.22-0.50] | P=0.34 |
| ≥65 | 0.44 [0.30-0.64] | |
| **Melanoma (N=6 trials)** | | |
| <65 | 0.68 [0.56-0.81] | P=0.32 |
| ≥65 | 0.77 [0.64-0.94] | |
| **Multiple Myeloma (N=3 trials)** | | |
| <65 | 0.59 [0.50-0.69] | P=0.15 |
| ≥65 | 0.72 [0.58-0.91] | |

**Table 2:** HRs [95% CIs] and test for subgroup differences; <65 versus ≥65 subgroup analysis

| | | |
|---|---|---|
| **All Drugs – OS (N=35 trials)** | | |
| Young | 0.82 [0.77-0.87] | P=0.75 |
| Elderly | 0.83 [0.77-0.89] | |
| **All Drugs – PFS (N=49 trials)** | | |
| Young | 0.54 [0.49-0.60] | P=0.61 |
| Elderly | 0.56 [0.50-0.63] | |
| **Targeted Agents (N=71 trials)** | | |
| Young | 0.62 [0.57-0.66] | P=0.18 |
| Elderly | 0.67 [0.61-0.73] | |
| **Chemotherapy Drugs (N=13 trials)** | | |
| Young | 0.73 [0.65-0.81] | P=0.59 |
| Elderly | 0.76 [0.67-0.87] | |
| **Lung Cancer (N=16 trials)** | | |
| Young | 0.70 [0.61-0.80] | P=0.37 |
| Elderly | 0.77 [0.65-0.93] | |
| **Colorectal Cancer (N=8 trials)** | | |
| Young | 0.69 [0.61-0.78] | P=0.75 |
| Elderly | 0.71 [0.61-0.82] | |
| **Renal Cell Carcinoma (N=7 trials)** | | |
| Young | 0.66 [0.52-0.84] | P=0.23 |
| Elderly | 0.82 [0.63-1.06] | |
| **Chronic Lymphocytic Leukaemia (N=6 trials)** | | |
| Young | 0.33 [0.22-0.51] | P=0.55 |
| Elderly | 0.40 [0.27-0.60] | |
| **Melanoma (N=6 trials)** | | |
| Young | 0.68 [0.57-0.81] | P=0.10 |
| Elderly | 0.82 [0.71-0.95] | |
| **Multiple Myeloma (N=4 trials)** | | |
| Young | 0.56 [0.49-0.64] | P=0.21 |
| Elderly | 0.67 [0.52-0.88] | |

**Table 3:** HRs [95% CIs] and test for subgroup differences; Young versus Elderly subgroup analysis

## Conclusions

- Our results suggest that elderly and young patients derive similar relative survival benefits from novel oncology drugs.
- In settings where there is no other direct high-level evidence of elderly patients deriving less benefit than younger patients, it is reasonable to consider offering novel oncology drugs to elderly patients who fulfil trial eligibility.
- In future, reporting of age-based toxicity and quality of life results are encouraged.